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FROM: Peter J. Yim

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Comments:**PLEASE PROCESS THE ATTACHED.**

Re: U.S. Patent Application No. 09/588,242
For: DATA STORAGE SYSTEM AND PROCESS
By: Lloyd A. POSTON
Our Ref: 24921-20245.00

Attached is the following:

1. Transmittal (1 page)
2. Fee Transmittal (in duplicate, 2 pages)
3. Appeal Brief (18 pages)

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Pg. 3 was not received

af-1910154

PTO/SB/21 (09-04)


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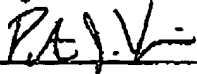
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TRANSMITTAL FORM <i>(to be used for all correspondence after initial filing)</i>	Application Number	09/588,242	
	Filing Date	June 6, 2000	
	First Named Inventor	Lloyd A. POSTON	
	Art Unit	2186	
	Examiner Name	M. Anderson	
Total Number of Pages in This Submission	21	Attorney Docket Number	249212024500

ENCLOSURES (Check all that apply)		
<input checked="" type="checkbox"/> Fee Transmittal Form (in duplicate, 2 pages) <input type="checkbox"/> Fee Attached <input type="checkbox"/> Amendment/Reply <input type="checkbox"/> After Final <input type="checkbox"/> Affidavits/declaration(s) <input type="checkbox"/> Extension of Time Request <input type="checkbox"/> Express Abandonment Request <input type="checkbox"/> Information Disclosure Statement <input type="checkbox"/> Certified Copy of Priority Document(s) <input type="checkbox"/> Reply to Missing Parts/Incomplete Application <input type="checkbox"/> Reply to Missing Parts under 37 CFR 1.52 or 1.53	<input type="checkbox"/> Drawing(s) <input type="checkbox"/> Licensing-related Papers <input type="checkbox"/> Petition <input type="checkbox"/> Petition to Convert to a Provisional Application <input type="checkbox"/> Power of Attorney, Revocation Change of Correspondence Address <input type="checkbox"/> Terminal Disclaimer <input type="checkbox"/> Request for Refund <input type="checkbox"/> CD, Number of CD(s) _____ <input type="checkbox"/> Landscape Table on CD <div style="border: 1px solid black; padding: 2px;">Remarks</div>	<input type="checkbox"/> After Allowance Communication to TC <input type="checkbox"/> Appeal Communication to Board of Appeals and Interferences <input checked="" type="checkbox"/> Appeal Communication to TC (Appeal Notice, Brief, Reply Brief) (18 pages) <input type="checkbox"/> Proprietary Information <input type="checkbox"/> Status Letter <input checked="" type="checkbox"/> Other Enclosure(s) (please identify below): Facsimile Cover Sheet

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Firm Name	MORRISON & FOERSTER LLP (Customer No. 20872)		
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Printed name	Peter J. Yim		
Date	May 23, 2005	Reg. No.	44,417

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sf-1935315

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Effective on 12/03/2004. Fees pursuant to the Consolidated Appropriations Act, 2005 (P.L. 108-447). FEE TRANSMITTAL For FY 2005		Complete If Known	
<input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27		Application Number	
		09/588,242	
		Filing Date	
		June 6, 2000	
		First Named Inventor	
		Lloyd A. POSTON	
		Examiner Name	
		M. Anderson	
		Art Unit	
		2186	
TOTAL AMOUNT OF PAYMENT		(\$) 500.00	
		Attorney Docket No.	
		249212024500	

METHOD OF PAYMENT (check all that apply)	
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<input checked="" type="checkbox"/> Deposit Account Deposit Account Number: <u>03-1952</u> Deposit Account Name: <u>Morrison & Foerster LLP</u>	
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FEE CALCULATION							
1. BASIC FILING, SEARCH, AND EXAMINATION FEES							
Application Type	FILING FEES		SEARCH FEES		EXAMINATION FEES		Fees Paid (\$)
	Fee (\$)	Small Entity Fee (\$)	Fee (\$)	Small Entity Fee (\$)	Fee (\$)	Small Entity Fee (\$)	
Utility	300	150	500	250	200	100	
Design	200	100	100	50	130	65	
Plant	200	100	300	150	160	80	
Reissue	300	150	500	250	600	300	
Provisional	200	100	0	0	0	0	
							Small Entity
							Fee (\$)
Each claim over 20 (including Reissues)							50
Each independent claim over 3 (including Reissues)							200
Multiple dependent claims							360
							180
Total Claims		Extra Claims	Fee (\$)	Fee Paid (\$)	Multiple Dependent Claims		
36		0	50	0.00	Fee (\$)		Fee Paid (\$)
					360		0.00
Indep. Claims		Extra Claims	Fee (\$)	Fee Paid (\$)			
6		0	200	0.00			
2. APPLICATION SIZE FEE							
If the specification and drawings exceed 100 sheets of paper (excluding electronically filed sequence or computer listings under 37 CFR 1.52(e)), the application size fee due is \$250 (\$125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(e).							
Total Sheets		Extra Sheets	Number of each additional 50 or fraction thereof		Fee (\$)	Fee Paid (\$)	
- 100 =		50	(round up to a whole number) x			0.00	
3. OTHER FEE(S)							
Non-English Specification, \$130 fee (no small entity discount)							0.00
Other (e.g., late filing surcharge): 1402 Filing a brief in support of an appeal							500.00

SUBMITTED BY			
Signature		Registration No. (Attorney/Agent)	44,417
Name (Print/Type)	Peter J. Yim	Telephone	(415) 288-6373
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Docket No.: 249212024500
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Dated: May 23, 2005

Signature: 

(Peter J. Yim)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Lloyd A. POSTON

Application No.: 09/588,242

Confirmation No.: 8053

Filed: June 6, 2000

Art Unit: 2186

For: DATA STORAGE SYSTEM AND PROCESS

Examiner: M. D. Anderson

APPEAL BRIEF

MS Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

As required under § 41.37(a), this brief is filed within two months of the Notice of
Appeal filed in this case on March 23, 2005, and is in furtherance of said Notice of Appeal.

The fees required under § 41.20(b)(2) are dealt with in the accompanying FEE
TRANSMITTAL.

This brief contains items under the following headings as required by 37 C.F.R. § 41.37
and M.P.E.P. § 1206:

- | | |
|------|---|
| I. | Real Party in Interest |
| II | Related Appeals and Interferences |
| III. | Status of Claims |
| IV. | Status of Amendments |
| V. | Summary of Claimed Subject Matter |
| VI. | Grounds of Rejection to be Reviewed on Appeal |

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VII.	Argument
VIII.	Claims Appendix
IX.	Evidence Appendix
X.	Related Proceedings Appendix
Appendix A	Claims

I. REAL PARTY IN INTEREST

The real party in interest for this appeal is:

Quantum Corporation.

II. RELATED APPEALS, INTERFERENCES, AND JUDICIAL PROCEEDINGS

There are no other appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS

A. Total Number of Claims in Application

There are 36 claims pending in application.

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B. Current Status of Claims

1. Claims canceled: 2, 11
2. Claims withdrawn from consideration but not canceled: 0
3. Claims pending: 1, 3-10, 12-38
4. Claims allowed: 0
5. Claims rejected: 1, 3-10, 12-38

C. Claims On Appeal

The claims on appeal are claims 1, 3-10, 12-38

IV. STATUS OF AMENDMENTS

Applicant did not file an Amendment After Final Rejection.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Independent claim 1 defines an apparatus directed to mass storage backup. The apparatus includes an input to receive mass storage write commands 109, which comprise data 113 and a mass storage address 111 at which the data is to be written. (Page 9, lines 4-5; Figure 4.) The apparatus also includes a source of time information 205. (Page 9, lines 8-9, 11-13; Figure 4.) A circuit 403 associates a mass storage write command 109 with the time information to create a log entry. (Page 9, lines 8-9; Figure 4.) The circuit 403 queues log entry and periodically sends one or more of the queued log entries to a storage. (Page 9, lines 8-11; Figure 4.)

Independent claim 9 defines a method for backing up a mass storage. The method includes accepting mass storage write commands 109 at a log-assisted disk 403. (Page 9, lines 4-5; Figure 4.) A time is appended to each of the mass storage write commands 109 at the log-assisted disk 403 to form a log entry. (Page 9, lines 8-9; Figure 4.) The log entries are queued in a log queue at the log-assisted disk 403. (Page 9, lines 8-9; Figure 4.) Log entries from the log queue are

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written into a log file 405 in a local mass storage different from the mass storage to be backed up. (Page 9, lines 8-11; Figure 4.)

Independent claim 17 defines a method of recreating the state of a mass storage device at a given time. The method includes accepting a snapshot 501 of the state of a mass storage device taken at a point in time earlier than the given time. (Page 10, lines 16-17; Figure 5.) Log entries 511 having timestamps later than the point in time of the snapshot 501 are accepted. (Page 10, lines 18-21; Figure 5.) The snapshot is written to a storage device on which the mass storage device is being restored. (Page 10, lines 21 – page 11, line 2.) The log entries having timestamps later than the point in time of the snapshot is written to the storage device on which the mass storage device is being restored. (Page 10, lines 21 – page 11, line 2.) The writing of the log entries is terminated when the timestamp of the log entry is equal to the given time. (Page 10, lines 21 – page 11, line 2.)

Independent claim 20 defines an article of manufacture. The article of manufacture comprises a computer readable media and computer code to cause a computer to accept mass storage write commands 109 for a mass storage to be backed up at a log-assisted disk 403. (Page 9, lines 4-5; Figure 4.) A time is appended to each mass storage write command 109 to form a log entry at the log-assisted disk 403. (Page 9, lines 8-9; Figure 4.) Log entries are queued in a log queue at the log-assisted disk 403. (Page 9, lines 8-9; Figure 4.) Log entries from the log queue are written into a log file 405 in a mass storage different from the mass storage to be backed up. (Page 9, lines 8-11; Figure 4.)

Independent claim 21 defines a backup system for continuous backup of computer data stored at a computer to a mass storage system. The backup system includes an operating system 107 for receiving write commands 105 from an application 103 installed on the computer 201 and for converting each received write command 105 into a sector write 109 having a sector address 111 and sector data 113. (Page 6, lines 19-23; Figure 2.) The backup system also includes a source of time information 205 and a log-assisted disk 203 for processing sector writes 109 sent to the log-assisted disk 203 by the operating system 107. (Page 7, lines 3-5; Figures 2, 3.) The log-assisted disk 203 receives the sector writes 109, accumulates the sector writes 109, associates each sector

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write with the time information 303 to create a log entry, and queues log entries in a log queue 305. (Page 7, lines 3-5; Figures 2, 3.) A storage 125 accepts the log entries from the log queue 305. (Page 7, lines 8-11, 12-13; Figures 2, 3.) A communication means 119 communicates the log entry to the storage 125. (Page 7, lines 5-11.) The communication means is a means-plus-function element. A network interface card (NIC), such as an ethernet card, is a structure described in the specification corresponding to the communication means. (Page 6, lines 11-18; Figures 2, 3.) The operating system 107, the source of time information 205, the log-assisted disk 203, and the communicating means 119 are in electrical communication with each other within a computer 201. (Figures 2, 3.)

Independent claim 33 is a method for continuously backing up computer data to a mass storage system. The method includes receiving write commands 105 from an application 103 running on a computer 201. (Page 6, lines 19-23; Figure 2.) Each received write command 105 is converted to a sector write 109 having a sector address 111 and sector data 113. (Page 6, lines 19-23; Figure 2.) Each sector write 109 is sent to a log-assisted disk 203. (Page 7, lines 3-5; Figures 2, 3.) Each sector write 109 is combined with a time stamp 303 at the log-assisted disk 203 to form a log entry. (Page 7, lines 3-5; Figures 2, 3.) Log entries are queued at the log-assisted disk 203. (Page 7, lines 3-5; Figures 2, 3.) The log entries are communicated to a mass-storage system 125. (Page 7, lines 8-11, 12-13; Figures 2, 3.) The log entries are stored in a log file at the mass storage system 125. (page 7, lines 12-13; Figures 2, 3.)

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

A. Whether claims 1, 3, 5-10, 12, 13, 20-23, 25, 27-33, and 35-37 are anticipated by U.S. Patent No. 6,170,063 (the Golding reference) under 35 U.S.C. 102(e).

B. Whether claim 17 is anticipated by U.S. Patent No. 5,008,786 (the Thatte reference) under 35 U.S.C. 102(b).

C. Whether claims 4 and 26 are unpatentable over the Golding reference under 35 U.S.C. 103(a).

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D. Whether claim 14 is unpatentable over the Golding reference and U.S. Patent No. 5,943,672 (the Yoshida reference) under 35 U.S.C. 103(a).

E. Whether claims 15 and 34 are unpatentable over the Golding reference and U.S. Patent No. 6,182,198 (the Hubis reference) under 35 U.S.C. 103(a).

F. Whether claims 16 and 38 are unpatentable over the Golding reference and U.S. Patent 5,403,639 (the Belsan reference) under 35 U.S.C. 103(a).

G. Whether claim 18 is unpatentable over the Thatte reference and the Golding reference under 35 U.S.C. 103(a).

H. Whether claim 19 is unpatentable over the Thatte reference and the Golding reference under 35 U.S.C. 103(a).

I. Whether claim 24 is unpatentable over the Golding and U.S. Patent No. 5,819,020 (the Beeler reference) under 35 U.S.C. 103(a).

VII. ARGUMENT

Claims 1, 3-10, and 12-38 were finally rejected by the Examiner in a Final Office Action mailed on November 19, 2004. Applicants respectfully request reversal of the rejection of these claims in view of the following remarks.

A. Claims 1, 3, 5-10, 12, 13, 20-23, 25, 27-33, and 35-37

Claims 1, 3, 5-10, 12, 13, 20-23, 25, 27-33, and 35-37 stand rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 6,170,063 (the Golding reference). Applicants assert that the Golding reference fails to disclose each and every element recited in these claims.

1. Claim 1

Claim 1 recites, in part, "a circuit for associating a mass storage write command with the time information to create a log entry." Claim 1 also recites that "the circuit queues log entries."

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The Golding reference discloses controllers 22, 32 that receive write messages 12, 13 generated by a processor 11. (See column 3, lines 30-55, FIGURE 1.) As depicted in FIGURE 1 of the Golding reference, write messages 12, 13 generated by processor 11 include timestamps (i.e., $t=10$) indicating when the write messages were generated. (See column 3, lines 45-55.)

Because the write messages generated by processor 11 already include timestamps before the write messages are received by controllers 22, 32, Applicants have asserted that the controllers disclosed in the Golding reference do not anticipate the circuit recited in claim 1 that associates "a mass storage write command with the time information to create a log entry."

In the Final Office Action, the Examiner responded by stating:

"Golding's controller though, takes a message and creates a log entry by taking the data in the message and associates the time stamp data in that message when forming the log entry. Some sort of 'association' is done to go from a message to a log entry that contains time stamp info."

Applicants assert that the Examiner's assertion that Golding's controller creates a log entry by taking the data in the message and associating the timestamp data is not supported by the disclosure of the Golding reference. In contrast, the Golding reference only discloses placing a message in a log after testing the timestamp of the message to determine if the message was sent within a reasonable time frame. (See column 5, lines 10-25.)

In particular, as noted above, the Golding reference explicitly discloses that the write messages generated by processor 11 include timestamps. The Golding reference discloses that, after receiving a write message, each disk compares the message timestamp to the disk's local clock to determine if the message was sent within a reasonable time frame. (See column 5, lines 10-12.) If the timestamp fails the test, the disk sends a negative acknowledgement back to the sender and discards the message. (See column 5, lines 19-21.) If the timestamp passes the test, the disk places the message in the log. (See column 5, lines 23-25.) The Golding reference, however, does not disclose taking the data in the message and associating the time stamp data in the message when forming the log entry as asserted by the Examiner.

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Additionally, Applicants assert that the Examiner's conclusion that "some sort of 'association' is done" is insufficient to establish that the Golding reference inherently discloses that the controllers associate "a mass storage write command with the time information to create a log entry." As set forth in M.P.E.P. 2112 (IV), to show inherency, the Examiner must provide "a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art." Applicants assert that the Examiner has not provided any fact and/or technical reasoning to establish that it necessarily flows from the teachings of the Golding reference that the controller associates the data in the message with the time stamp data in the message to form a log entry. Instead, as noted above, the Golding reference explicitly discloses placing a message in a log if the message is determined to have been sent within a reasonable time frame by comparing the timestamp of the message to a local clock. The Golding reference does not explicitly disclose any additional processing or modification of the message after the message has been determined to have been sent within a reasonable time frame and before the message is placed in the log. Applicants assert that there is no technical reason why the write message can not be placed into the log without modifying the write message, which is what is explicitly disclosed in the Golding reference.

Thus, Applicants assert that the Golding reference fails to disclose explicitly or inherently each and every element of claim 1. Therefore, Applicants assert that claim 1 is allowable over the Golding reference.

2. Claim 9

Claim 9 recites, "appending, at the log assisted disk, a time to each of said mass storage write commands to form a log entry," and "queuing log entries in a log queue at the log-assisted disk." For the reasons set forth above with regard to claim 1, Applicants assert that the Golding reference fails to disclose each of these elements of claim 9.

3. Claim 20

Claim 20 recites, "append a time to each of said mass storage write commands to form a log entry at the log-assisted disk," and "queue log entries in a log queue at the log-assisted disk." For the reasons set forth above with regard to claim 1, Applicants assert that the Golding reference fails to disclose each of these elements of claim 20.

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4. Claim 21

Claim 21 recites a log-assisted disk, where a sector write is associated with time information to create a log entry, and log entries are queued in a log queue. For the reasons set forth above with regard to claim 1, Applicants assert that the Golding reference fails to disclose each of these elements of claim 21.

5. Claim 33

Claim 33 recites "combining each sector write with a time stamp at the log-assisted disk to form a log entry," and "queuing log entries at the log-assisted disk." For the reasons set forth above with regard to claim 1, Applicants assert that the Golding reference fails to disclose each of these elements of claim 33.

6. Claims 3, 5-8, 10, 12, 13, 22, 23, 25, 27-32, and 35-37

Claims 3, 5-8, 10, 12, 13, 22, 23, 25, 27-32, and 35-37 depend from claims 1, 9, 21, and 33. Thus, Applicants assert that these claims are allowable for at least the reason that they depend from allowable independent claims.

B. Claim 17

Claim 17 stands rejected under 35 U.S.C. 102(b) as being anticipated by U.S. patent No. 5,008,786 (the Thatte reference).

Claim 17 recites, "writing the snapshot to a storage device on which the mass storage device is being restored." Claim 17 also recites, "writing the log entries having timestamps later than the point in time of the snapshot to the storage device on which the mass storage device is being restored."

Applicants have asserted that the "storage device on which the mass storage device is being restored" recited in claim 17 corresponds to the "new disk" rather than the "archival medium" disclosed in the Thatte reference. Applicants have also asserted that the Thatte reference does not disclose "writing the snapshot (which was taken at a time earlier than the given time)" to the "new disk" and "writing the log entries having timestamps later than the point in time of the snapshot" to the "new disk."

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The Examiner has failed to respond to Applicants assertions. Instead, in the Final Office Action, the Examiner has repeated that the Thatte reference discloses writing archive pages and later pages to the "archive medium."

Thus, Applicants assert that the Examiner has failed to show that the Thatte reference discloses each and every element of claim 17. Therefore, Applicants assert that claim 17 is allowable over the Thatte reference.

C. Claims 4 and 26

Applicants assert that claims 4 and 26 are allowable for at least the reason that they depend from allowable independent claims.

D. Claim 14

Applicants assert that claim 14 is allowable for at least the reason that it depends from an allowable independent claim.

E. Claims 15 and 34

Applicants assert that claims 15 and 34 are allowable for at least the reason that they depend from allowable independent claims.

F. Claims 16 and 38

Applicants assert that claims 16 and 38 are allowable for at least the reason that they depend from allowable independent claims.

G. Claim 18

Applicants assert that claim 18 is allowable for at least the reason that it depends from an allowable independent claim.

H. Claim 19

Applicants assert that claim 19 is allowable for at least the reason that it depends from an allowable independent claim.

I. Claim 24

Applicants assert that claim 24 is allowable for at least the reason that it depends from an allowable independent claim.

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VIII. CLAIMS APPENDIX

A copy of the claims involved in the present appeal is attached hereto as Appendix A. As indicated above, the claims in Appendix A do include the amendments filed by Applicant on November 3, 2004.

IX. EVIDENCE APPENDIX

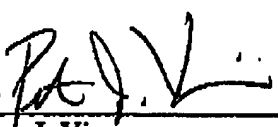
No evidence pursuant to §§ 1.130, 1.131, or 1.132 or entered by or relied upon by the examiner is being submitted.

X. RELATED PROCEEDINGS APPENDIX

No related proceedings are referenced in II. above, or copies of decisions in related proceedings are not provided, hence no Appendix is included.

Dated: May 23, 2005

Respectfully submitted,


By _____
Peter J. Yim

Registration No.: 44,417
MORRISON & FOERSTER LLP
425 Market Street
San Francisco, California 94105-2482
(415) 268-6373

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Application No.: 09/588,242

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APPENDIX A

Claims Involved in the Appeal of Application Serial No. 09/588,242

Claim 1 (Previously Presented): An apparatus for producing a mass storage backup, the apparatus comprising:

an input for receiving mass storage write commands, said commands comprising data and a mass storage address at which the data is to be written;

a source of time information;

a circuit for associating a mass storage write command with the time information to create a log entry; and

a storage for accepting log entries from the circuit, wherein the circuit queues log entries and periodically sends one or more of the queued log entries to the storage.

Claim 2 (Canceled).

Claim 3 (Previously Presented): An apparatus as in claim 1 wherein the storage for accepting the log entries further comprises:

a network connection for accepting the log entries and for providing said log entries into a network; and

a server for accepting log entries from the network and for providing the log entries to a log file on a log file mass storage device.

Claim 4 (Original): An apparatus as in claim 1 wherein the network is the Internet.

Claim 5 (Original): An apparatus as in claim 1 wherein the mass storage address at which the data is to be written comprises a sector address.

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Claim 6 (Original): An apparatus as in claim 1 wherein the storage for accepting log entries is the mass storage.

Claim 7 (Original): An apparatus as in claim 1 wherein the mass storage is a hard disk system.

Claim 8 (Original): An apparatus as in claim 1 wherein the storage for accepting log entries is a RAM based virtual disk.

Claim 9 (Previously Presented): A method for backing up a mass storage the method comprising:

accepting, at a log-assisted disk, mass storage write commands for the mass storage to be backed up;

appending, at the log-assisted disk, a time to each of said mass storage write commands to form a log entry;

queuing log entries in a log queue at the log-assisted disk; and

writing log entries from the log queue into a log file in a local mass storage different from the mass storage to be backed up.

Claim 10 (Original): A method as in claim 9 further comprising storing the log file in a non volatile storage.

Claim 11 (Canceled).

Claim 12 (Previously Presented): A method as in claim 10 wherein the local mass storage is a hard disk.

Claim 13 (Original): A method as in claim 10 wherein the storing the log file in a non volatile storage further comprises:

providing the log file to a network interface;

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using the network interface to couple the log file into a network;
accepting the log file from the network; and
storing the log file on a mass storage device.

Claim 14 (Original): A method as in 13 wherein using the network interface to couple the log file into a network further comprises:

receiving a status from the network;
testing the status to determine if the network traffic is low; and
coupling the log file into the network dependant on the network traffic.

Claim 15 (Original): A method as in claim 9 the method further comprising taking a snapshot of the mass storage to be backed up prior to accepting mass storage write commands for the mass storage to be backed up.

Claim 16 (Previously Presented): A method as in claim 9 wherein the step of writing log entries from the log queue into a log file further comprises:

determining the sector to be written to from the most recent log entry;
searching for log entries having an earlier time stamp which writes to the same address; and
deleting any log entries with an earlier time stamp which writes data to the same address as the most recent log entry.

Claim 17 (Previously Presented): A method of recreating the state of a mass storage device at a given time the method comprising:

accepting a snapshot of the state of a mass storage device taken at a point in time earlier than the given time;
accepting log entries having timestamps later than the point in time of the snapshot;
writing the snapshot to a storage device on which the mass storage device is being restored;
writing the log entries having timestamps later than the point in time of the snapshot to the storage device on which the mass storage device is being restored; and

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terminating the writing of the log entries when the timestamp of the log entry is equal to the given time.

Claim 18 (Previously Presented): A method as in claim 17 wherein the accepting a snapshot of the state of a mass storage device and accepting log entries from the time of the snapshot further comprises accepting a snapshot of the state of a mass storage device and accepting log entries from the point in time of the snapshot from a network connection.

Claim 19 (Original): A method as in claim 18 where the network is the Internet.

Claim 20 (Previously Presented): An article of manufacture comprising a computer readable media and computer code which causes a computer to:

accept mass storage write commands for a mass storage to be backed up at a log-assisted disk;

append a time to each of said mass storage write commands to form a log entry at the log-assisted disk;

queue log entries in a log queue at the log-assisted disk; and

write log entries from the log queue into a log file in a mass storage different from the mass storage to be backed up.

Claim 21 (Previously Presented): A backup system for enabling continuous backup of computer data stored at a computer to a mass storage system, said backup system comprising:

a) an operating system for receiving write commands from an application installed on the computer and for converting each received write command into a sector write having a sector address and sector data;

b) a source of time information;

c) a log-assisted disk for processing sector writes sent to the log-assisted disk by the operating system, said processing including receiving the sector writes, accumulating the sector writes, associating each sector write with the time information to create a log entry, and queuing log entries in a log queue;

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d) a storage for accepting log entries from the log queue; and
e) means for communicating the log entry to the storage, wherein the operating system, the source of time information, the log-assisted disk, and the communicating means are in electrical communication with each other within a computer.

Claim 22 (Previously Presented): The backup system of claim 21 wherein the storage for accepting log entries is located within the computer.

Claim 23 (Previously Presented): The backup system of claim 21 wherein the storage for accepting log entries is in network communication with the computer.

Claim 24 (Previously Presented): The backup system of claim 23 wherein the communication means is a network interface card.

Claim 25 (Previously Presented): The backup system of claim 23 wherein the storage for accepting log entries receives log entries from multiple computers in a network.

Claim 26 (Previously Presented): The backup system of claim 23 wherein the network is the Internet.

Claim 27 (Previously Presented): The backup system of claim 21 wherein the storage for accepting log entries further comprises:

- a) a network connection for accepting the log entries and for sending said log entries into network; and
- b) a server for accepting log entries from the network and for providing the log entries to a log file on a log file mass storage device.

Claim 28 (Previously Presented): The backup system of claim 21 wherein the storage for accepting log entries is a hard disk system.

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Claim 29 (Previously Presented): The backup system of claim 21 wherein the storage for accepting log entries is a RAM-based virtual disk.

Claim 30 (Previously Presented): The backup system of claim 21 wherein the storage for accepting log entries is a non-volatile storage.

Claim 31 (Previously Presented): The backup system of claim 27 wherein the mass storage device is a hard disk system.

Claim 32 (Previously Presented): The backup system of claim 27 wherein the mass storage device is a non-volatile storage.

Claim 33 (Previously Presented): A method for continuously backing up computer data to a mass storage system, said method comprising:

- a) receiving write commands from an application running on a computer;
- b) converting each received write command to a sector write having a sector address and sector data;
- c) sending each sector write to a log-assisted disk;
- d) combining each sector write with a time stamp at the log-assisted disk to form a log entry;
- e) queuing log entries at the log-assisted disk;
- f) communicating the log entries to a mass storage system; and
- g) storing the log entries in a log file at the mass storage system.

Claim 34 (Previously Presented): The method of claim 33 further including taking a snapshot of the data stored on the computer prior to receiving write commands.

Claim 35 (Previously Presented): The method of claim 33 wherein the mass storage system is in network communication with the computer.

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Claim 36 (Previously Presented): The method of claim 33 wherein the mass storage system is located at the computer.

Claim 37 (Previously Presented): The method of claim 35 wherein communicating the log entries to the mass storage system is further defined by:

- a) providing the log entries to a network interface at the computer;
- b) using the network interface to couple the log entries into a network; and
- c) accepting the log entries from the network at the mass storage system.

Claim 38 (Previously Presented): The method of claim 33 wherein the step of storing the log entries in a log file is further defined by:

- a) determining a sector address to be written to from a received log entry;
- b) searching for log entries having an earlier time stamp which were written to the same sector address; and
- c) deleting any log entries with an earlier time stamp which were written to the same sector address as the received log entry.

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